



User's Manual

CW5000

Industrial Chiller



INSTECH, Inc.

Warranty

June 6, 2023

INSTECH, Inc. guarantees the product will conform to the specifications outlined in this manual and will remain free of defects in workmanship and materials for one year from the date of delivery. Should a product, in *INSTECH*'s opinion, malfunction during the warranty period because of a defect in workmanship or material, *INSTECH* will repair or replace it at no charge to the buyer, provided the product has not been subject to accidental damage, misuse, abuse, or unauthorized alteration, modification, and/or repair.

Examples of actions that will make this warranty null and void include, but are not limited to, the following:

- ◆ Storing or operating the device at any temperature outside the operating and storage temperature range.
- ◆ Performing or attempting to perform unauthorized service or repair.
- ◆ Resale -- except through an authorized dealer.

Products requiring service under this WARRANTY should be delivered to *INSTECH*, Inc. All portions of such systems, hardware, and software should be sent, along with proof of purchase if obtained from an authorized dealer. The buyer must insure the product or assume the risk of damage or loss in transit. If unable to repair or replace the product, *INSTECH* will refund the purchase price paid by the original buyer.

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THE FOREGOING WARRANTY IS IN LIEU OF AND TO THE EXCLUSION OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. *INSTECH*, INC.'S LIABILITY AND THE BUYER'S EXCLUSIVE REMEDY FOR BREACH OF THE FOREGOING WARRANTY SHALL BE LIMITED TO THE REPAIR OR REPLACEMENT OF THE PRODUCT OR REFUND OF THE PURCHASE PRICE. UNDER NO CIRCUMSTANCES WILL *INSTECH* BE LIABLE TO THE BUYER IN ANY WAY FOR DAMAGES, INCLUDING ANY LOST PROFITS, LOST SAVINGS, OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR MISUSE OF THE PRODUCT, OR *INSTECH*'S BREACH OF THE FOREGOING WARRANTY



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Chapter 0. Safety Information



Within this manual, a set of symbols are used to call attention to Safety Warnings, Caution Notices, and Notes. The symbols are defined in Figure 1.

		
Warning Symbol	Caution Symbol	Note Symbol
Indicates a safety guideline that should be followed at all times	Indicates a caution notice that calls attention to a potential safety risk	Indicates an important notice which should be given careful consideration.

Figure 1: Symbol Legend



Documentation: The CW5000 Chiller is just one component of your Instec temperature control system. Be sure to carefully read, and follow the safety guidelines outlined for each component device in the system.



Water Leaks: While the CW5000 itself is well protected against water damage, the same cannot be said for equipment around, or connected to the CW5000. Before powering on the CW5000, be sure to secure all connections using a zip-tie or hose clamp to ensure a water-tight connection. Place the CW5000 in a secure location without electronics or sensitive samples below it. Be sure to consult the User's Manual for the INTEC Stage/Plate/Chuck being used with the CW5000, and be sure not to connect the chiller to the Gas-purge ports instead of the frame cooling ports. These ports should be clearly labelled in the manual.



Extreme Temperatures: While the *CW5000* case should never exceed ambient temperatures, special care should be taken with regard to the Stage/Plate/Chuck/ probe station being cooled. The sample area temperature can exceed 60°C, or drop below -20°C depending on the configuration. Always be aware of the operating temperature of your stage and avoid physical contact accordingly. Contact with extreme temperatures, hot or cold, may cause bodily harm.



Power Button: Power is supplied or interrupted on the CW5000 industrial chiller via a rocker switch located on the front panel of the controller. This button can be identified by the power symbol below in Figure 2. An identical switch is used to enable/disable the radiator fan, however, only the primary power switch will illuminate the red status LED also located on the front panel.

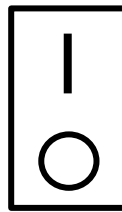


Figure 2: Primary Power Switch Indicator



Coolant choice: When using regular tap water with the CW5000, it is recommended to flush and then replenish the fluid reservoir every 1-2 months. This will help prevent the buildup of mineral deposits inside the chiller and extend the operational lifespan. INTEC recommends using primarily distilled water as the coolant, which greatly reduces the frequency that the water must be replaced.



Chapter 1. Introduction

1.1 Product Description

The CW5000 chiller is a convenient solution for providing powerful cooling power for *INTEC* temperature control system. By utilizing a refrigerant, the CW5000 Industrial Chiller can maintain constant temperature coolant circulation between 1°C~50°C with $\pm 1.0^\circ\text{C}$ accuracy. The chiller operates by circulating water through its internal reservoir, through the *INTEC* Stage/Plate/Chuck which needs to be cooled, then finally through a fan-cooled radiator. This circuit provides enough cooling power to keep most *INTEC* Stage/Plate/Chuck frames near room temperature, or even cooler, depending on what the set temperature of the chiller is.

When used for cooling *TEC* Stages/Plates/Chucks, the lower temperature limit of the sample area is limited by the amount of frame cooling used to maintain the thermal gradient across the *TEC* modules, and the geometry of the frame itself. To determine the lower temperature limit of your *INTEC* *TEC* Stage/Plate/Chuck, consult the documentation included with the Stage/Plate/Chuck, or contact support@instec.com. As a general rule of thumb, the cooler you can keep the frame, the cooler you can keep the sample. The CW5000 is primarily designed for convenience and is not sufficient for maximizing the sample cooling power of *INTEC* products.

1.2 Features

- ◆ Coolant temperature monitoring with automated over-temp cutoff capability
- ◆ Large capacity tank: 1.6gal (6L) internal water reservoir with water level monitoring
- ◆ Convenient form factor (22.1" L x 11.5" W x 16.9" H)
- ◆ Powerful cooling up to 5186 BTU per hour

Table 1: Specifications of CW5000

Specifications	
Model	CW5000
Input Power	110V/60Hz
Capacity	1.6 gal (6L)
Max Flow Rate	2.6 gal/min.(10L/min)
Dimensions	22.1 x 11.4 x 16.9 in
Material	Steel, ABS, Copper
Refrigerant	R410A
Max Lift	29.5 ft (9 m)
Cooling Capacity	50W/°C
Weight	57.2 lbs. (26 kg)
Current	4.6 – 6.5A
Compressor Power	0.9 HP (0.7kW)



Figure 3: Chiller Dimensions

Chapter 2. System Installation

2.1 Unpacking and Equipment List for CW5000

Please inspect the shipping carton for any signs of damage that may have occurred during shipment. If the shipping carton shows any signs of damage, please retain the shipping carton for insurance purposes. Open the shipping carton and remove and inspect the contents. Please report any occurrences of shipping damage to *INTEC* immediately.

Table 2: *Standard Parts for the CW5000*

Standard Parts for the CW5000	
One (1) CW5000 Chiller	
One (1) AC Power cord (Region Specific)	
Two (2) Silicone Rubber Tubing	

2.2 CW5000 Overview

The following sections describe the CW5000 Industrial Chiller controls and indicators.



Figure 4: CW5000 Overview Diagram



Figure 5: Alarm Output Terminal

Indicators

There are two indicators on the CW5000 front panel. The green “Normal” indicator is lit when the CW5000 is powered on and operating normally. The red “Alarm” indicator will illuminate if there is a reduction or blockage of fluid circulation.

Temperature Controller

The CW5000 is controlled manually from the Control Panel located on the front of the chiller. The default Control Panel display is the current coolant temperature, as well as the operating status. The temperature limits, alarm set point, and cooling delay can also be accessed and changed from the Control Panel. It is recommended to retain the default parameters until first consulting with an INTEC support specialist. Operation of the CW5000 from the Control Panel is described in the Quick Start Section below.

Inlet Dust Filters

Two inlet Dust Filters protect the Chiller airflow inlets. To ensure proper airflow, the Chiller should be positioned such that the Air Inlets are at least 50 mm away from obstructions such as walls or other instruments. The inlet dust filters should be cleaned at least once a month, or the chiller may wear out more quickly.

Vents

There are two vents on the back panel of the CW5000. To ensure proper airflow, the Chiller should be positioned such that the vents remain at least 200 mm away from obstructions such as walls or other instruments.

Alarm Output Terminal

The Alarm Output Terminal connects to an internal relay, which changes state when the coolant flow is interrupted or falls below critical levels. The supplied 3-pin connector can be used to

connect the Alarm Output Terminal relay to external equipment or alarms. The 3-pin connector should be wired appropriately based on the logic shown in **Table 3**. Note that the Alarm Output relay has a 10A current limit, and a working voltage limit of 500V. **Figure 5** contains a pinout diagram of the 3-pin Alarm Outlet connector.

Table 3: Alarm Outlet Connector Logic

Alarm Status	Pin pairs	Logic
Normal	1-2	Open
Normal	1-3	Closed (short)
Alarm	1-2	Closed (short)
Alarm	1-3	Open

Coolant Inlet and Outlet Ports

Connect your INTEC stage/plate/chuck to the Cooler Inlet (return from the instrument) and Outlet (supply to the instrument) with the supplied ID 8~10 mm braid-reinforced silicone rubber tubes. Safely route the tubes and then secure each end of the tubes with the supplied hose clamps.



TEC/Peltier-based stage/plate/chuck: If using an INTEC thermoelectric (TEC) stage/plate/chuck, a Fluid Valve Controller (FVC) accessory is required for proper operation. When using an FVC in conjunction with the CW5000, route the chiller outlet and inlet to the corresponding ports indicated on the FVC. Once those lines are secure, route the included second set of hoses to your INTEC stage/plate/chuck.

Fluid Reservoir Level Indicator

The coolant reservoir has a 1.6-gallon (6 Liter) capacity and should be filled with approximately 5 liters of fluid during operation. Allowing the fluid level to fall below 4 liters of fluid will reduce the cooling capacity and trigger the alarm. The Fluid Level Indicator is located on the chiller back panel and is shown in **Figure 6**.



Coolant Choice: INTEC recommends using water as the CW5000 coolant. Tap water is acceptable, but can lead to decreased chiller life. For best results, use filtered or distilled water.

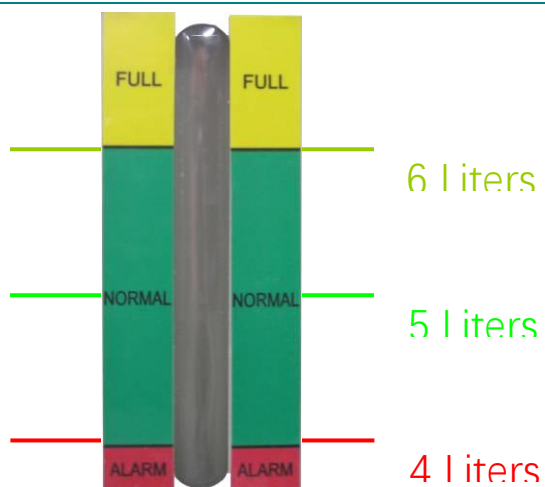


Figure 6: Fluid Reservoir Level Indicator

Reservoir Fill Cap

Fill the reservoir by first removing the threaded plastic cap shown in **Figure 4**. Then pour approximately 5 liters of cooling fluid and monitor the reservoir levels as described in the Fluid Reservoir Level Indicator section above.

Coolant Drain

The drain plug is located on the back panel of the chiller and can be used to drain the coolant reservoir.

Power Input

Connect the chiller to AC power using the supplied power cable.



Fuses: The AC input connector contains an installed 15A 250V fuse, as well as one spare 15A 250V fuse. Never replace this fuse with a fuse that has lower current or lower voltage specifications.



Electronics Safety: Ensure that the applied AC voltage and frequency match the specified input voltage and frequency on the back of the chiller.

2.3 Establishing Water Circulation

Place the CW5000 controller on a level, clean surface with ample ventilation. Because the CW5000 relies on a large radiator fan and refrigerator to keep the circulating water-cooled, make sure the vents on the sides and rear panel are unobstructed.

The rear panel of the CW5000 is shown in **Figure 7**. All electrical connections to the CW5000 use different types of ports to eliminate the possibility of an incorrect connection.

During the initial setup, or after setting up the device after a long period of inactivity (3+ months), it is recommended to drain and refill the reservoir, as algae growth may be present. To do this, unscrew the drain plug located on the rear panel, as shown in **Figure 4**, and allow the water to fully drain. Replace the drain cap once finished. Next, unscrew the water reservoir lid and fill the reservoir, with distilled or tap water, until the water level gauge shows that the reservoir is sufficiently full.



Circulator Safety: Be sure that the chiller is placed away from any open electronics to avoid electric shock. As an added precaution, it is recommended that all fluid ports are tightly secured using zip-ties or hose clamps **BEFORE** powering the chiller on.



Figure 7: Connections of Rear Panel of CW5000

2.4 System Setup and Operation

Once water circulation is established, disconnect the power cord from the CW5000. While the power is disconnected, connect the CW5000 to your INSTECH Fluid Valve Control box, by simply connecting the Inlet and Outlet ports to the respective ports on the valve box via the included silicone tubing. These ports are typically barbed hose fittings which are then connected to the frame of the Stage/Plate/Chuck. (For further instructions on how to do this, please see the provided valve box guide, stored on a USB flash drive). Finally, secure the connections using zip ties or hose clamps. Once the CW5000 has been securely connected to the Stage/Plate/Chuck, the Chiller may be reconnected to power and turned on.



Frame Cooling Port Identification: Be sure to consult the User's Manual for the INSTECH Stage/Plate/Chuck being used with the CW5000 to identify the frame cooling ports. Be sure not to connect the chiller to the Gas-purge ports instead of the frame cooling ports, as this may flood the Stage/Plate/Chuck, or the surrounding area, with water.

Chapter 3. Quick Start Guide

At the very least, before proceeding, follow the instructions in the System Setup section and Establishing Water Circulation section above.

Operation of the CW5000 Industrial Chiller

During normal operation, the default display on the Temperature Controller shows the current coolant temperature (**Figure 8**). Your CW5000 will be configured by INTEC to match the corresponding temperature control system, including the operating mode and parameters. The following section will describe the basic operation of the CW5000 and the steps to change parameters if needed.

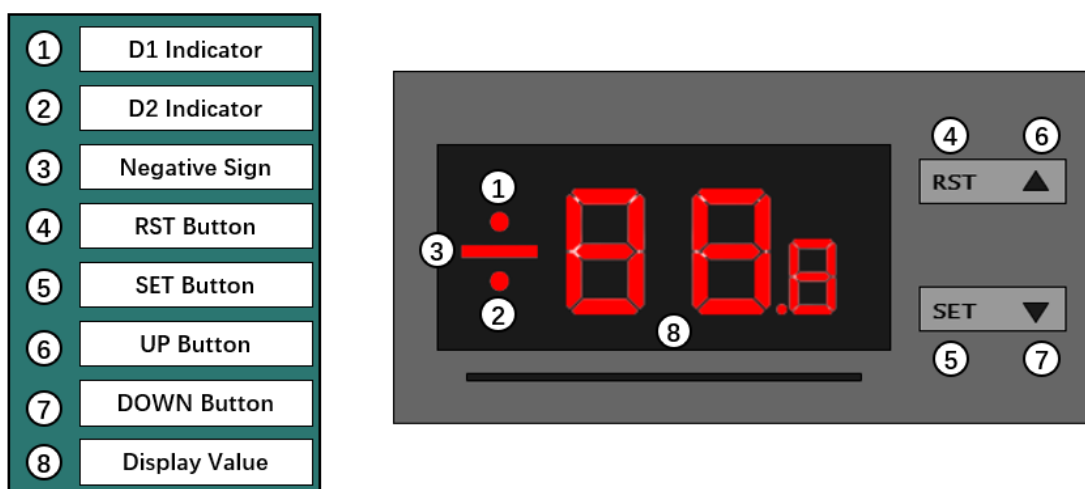


Figure 8: Temperature Controller Overview

The indicator lights D1 and D2 (1 and 2 in **Figure 8**) display the current chiller operating mode. The following table describes each operating state and its corresponding indicator status.

Table 4: Indicator Light Definition Table

D1 Solid On: Smart Mode	D2 On: Refrigeration Active
D1 Off: Constant Temperature Mode	D2 Off: Refrigeration Inactive
D1 Flashing On: Parameter-set mode or displaying room temp	D2 Flashing On: Energy Saving Mode

Table 5: Temperature Controller Key Functions

Action	Mode or Display
Default	Current Coolant Temperature (°C)
Click ▲ Button	NA
Click ▼ Button	Display Room Temperature
Click SET Button	Enter target temperature mode. In Constant temperature mode, use arrows to select coolant temperature. In Smart mode, use arrows to select the difference between the coolant and ambient temperature. Press SET again to exit the target temperature mode without saving changes.
Click RST Button	Press RST to confirm a value entered in target temperature mode.
Hold Set Button and ▲ for 5 seconds	Enters Advanced Parameter setting mode. Entering the parameter setting menu will display 0 on the display. Enter the password using the arrow keys(6 by default) to view and change Advanced Parameters.
While in Advanced Parameter setting mode (Hold)	
Click ▲ or ▼ Button	Moves between F0-F9 Parameters
Click Set Button	Select a parameter sub-menu. Once inside a parameter sub-menu, use the arrow buttons to change parameter values. Press SET again to exit the current parameter sub-menu.
Click Reset Button	Save changes and Exit Advanced Parameter set mode.

Table 6: Advanced Parameter Descriptions

Parameter Number	Parameter Label	Parameter	Range	Factory Default Setting	Note
1	F0	Temperature Setting	F9 - F8	25	Used in Constant Temperature Mode
2	F1	Temperature difference setting	-15 - +5	-2	Used in Smart Mode
3	F2	Cooling Hysteresis	0.1 - 3.0	.8	Determines the coolant temperature stability
4	F3	Control method	0 - 1	1	1 = Smart Mode, 0 = Constant Temperature mode
5	F4	High temp alarm	1 - 20	10	Units in degrees C
6	F5	Low temp alarm	1 - 20	15	Units in degrees C
7	F6	Room temp alarm	40 - 50	45	Units in degrees C
8	F7	Password	00 - 99	6	Used to prevent accidental changing of parameters
9	F8	High temp setting limit	F0 - 40	30	Highest target temperature that the user is allowed to enter
10	F9	Low temp setting limit	1 – F0	20	Highest target temperature that the user is allowed to enter

Table 7: Recommended Cooling Fluid and Temperature Limits

Cooling Fluid	Lower Temperature Limit
Distilled Water	0°C
Ethylene Glycol (antifreeze)	-25°C
Alcohol	-40°C

Chapter 4. Maintenance and Troubleshooting

4.1 Periodic Maintenance

Table 8: Periodic Maintenance summary

Every 2-3 Months	Every 3-5 years
• Drain and replace water in the reservoir	• Replace silicon rubber tubing if needed

4.1.1 Drain and replace water in the reservoir

To prevent the buildup of algae, hard water deposits, or other contaminants, it is recommended to change the water used in the CW5000 once every 2-3 months. When changing the water, be on the lookout for mineral deposits or algae growth. If excessive minerals are present, consider using distilled water to flush the CW5000 of sediment. If there is significant algae growth, consider using an anti-algae additive to prevent growth in the future, or change the water in the reservoir more frequently.

4.1.2 Replacing silicon rubber tubing

Over time, the silicon rubber tubing used to transfer water between the CW5000 and the stage/plate/chuck may dry out and become more prone to cracking. If the included CW5000 transfer lines become brittle, it may be a good idea to replace them before they fail and cause a water leak.

Chapter 5. Troubleshooting

Error Codes

Error codes will be displayed as detected by the chiller. Contact us at support@intec.com if error messages cannot be resolved.

Table 8: Error Codes

E1	E2	E3	E4	E5
Room temperature exceeds the limit	Water temperature exceeds the limit	Water temperature below the lower limit	Room temperature sensor failure	Water temperature sensor failure

Table 9: Troubleshooting Guide

Failure	Cause of Failure	Approach
The chiller does not power ON when the switch is turned to the ON position.	The power cord is not plugged in	Plug in the power cord
	Burnt out fuse	Replace the fuse inside the power socket on the rear panel
Flow alarm sounds even if there is fluid flow	The water level inside the reservoir is too low	Check for any leaks and add water
Fluid temperature is hot	Poor ventilation	Relocate the chiller to where there is ample ventilation
	Excessive heat load	Reduce the heat load, or a stronger chiller may be required for your application
Alarm sounds after adding water or changing water	Water came into contact with electronics	Dry off the chiller or leave the chiller to dry
	Damaged internal pump	Repair or replace the transfer pump
The chiller powers on but the fan does not run	The water temperature is below 20°C	Normal behavior, leave as is
Slow drainage	The reservoir cap is closed	Open the cap to the reservoir